

Monday 21 May 2012 – Morning

AS GCE SCIENCE

G641 Remote Sensing and the Natural Environment

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour



Candidate forename		Candidate surname	
--------------------	--	-------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- You are advised to show all the steps in any calculations.



Where you see this icon you will be awarded marks for the quality of written communication in your answer.

This means, for example, you should:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- organise information clearly and coherently, using specialist vocabulary when appropriate.
- You may use an electronic calculator.
- This document consists of **16** pages. Any blank pages are indicated.

AS SCIENCE RELATIONSHIPS SHEET

pressure = force \div area

energy transferred = mass \times specific heat capacity \times temperature rise

density = mass \div volume

wavenumber = 1 / wavelength

speed = frequency \times wavelength

energy = Planck constant \times frequency

current = charge \div time

power = voltage \times current

power loss = (current)² \times resistance

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

- 1 The Juan Fernández Islands are situated 670 km off the coast of Chile in the Pacific Ocean. There are three islands. They were formed when volcanoes erupted about 2 million years ago.



Fig. 1.1

The only native mammal on the islands is a seal, and there are no reptiles or amphibians.

- (a) State the scientific term used to describe the number of different species in an area.

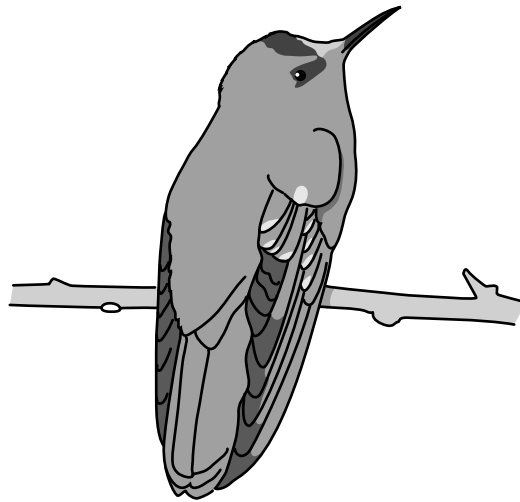
..... [1]

- (b) Most species of insects and birds found on the islands are unique and are not found anywhere else in the world.

Explain how this may have occurred.

.....
.....
.....
.....
.....
..... [3]

- (c) One of the native species is the brightly coloured firecrown hummingbird, Fig. 1.2, which feeds on nectar from flowers high above the ground. It has become critically endangered.



A firecrown hummingbird

Fig. 1.2

- (i) Suggest **and** explain two ways in which the arrival of humans on the islands could have contributed to the reduction in its numbers.

1.
.....
.....
.....

2.
.....
.....
..... [4]

- (ii) A lot of effort is being made to protect and save the firecrown hummingbird.

Suggest an economic benefit this might have for the islands.

.....
..... [1]

[Total: 9]

- 2 The kestrel, Fig. 2.1, is a bird of prey common in the UK. It has remarkable eyesight and can spot potential food from 50m away.

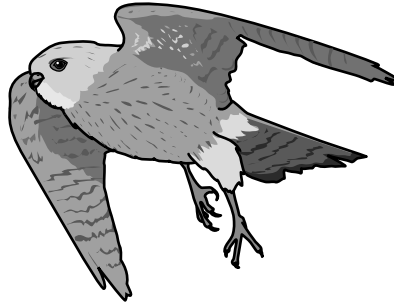


Fig. 2.1

- (a) The kestrel's eye contains similar photoreceptors to those in a human eye.

Name the two types of receptor and describe the type of light they detect.

1.
.....
.....
.....

2.
.....
.....
..... [4]

- (b) Kestrels, unlike humans, can detect ultraviolet light. This is particularly useful in locating voles which leave a trail of urine which glows in ultraviolet light.

What would be the source of ultraviolet light?

..... [1]

(c) A kestrel needs to eat about 6 voles a day. Once a vole has been digested, the chemicals it contains are used to release energy in the kestrel's cells.

(i) Name the process used to release the **maximum** amount of energy in the kestrel's cells.

..... [2]

(ii) Describe this process. In your answer include details of

- the sites in the cell involved in this process
- the reactants
- the products.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

(iii) Suggest two uses that the energy might be put to in the cells.

1.
.....
2.
..... [2]

[Total: 13]

- 3 Fig. 3.1 shows two images of the same forest fire. Image **A** has been produced using visible light and image **B** has been produced using thermal infrared radiation.



Image **A** – visible

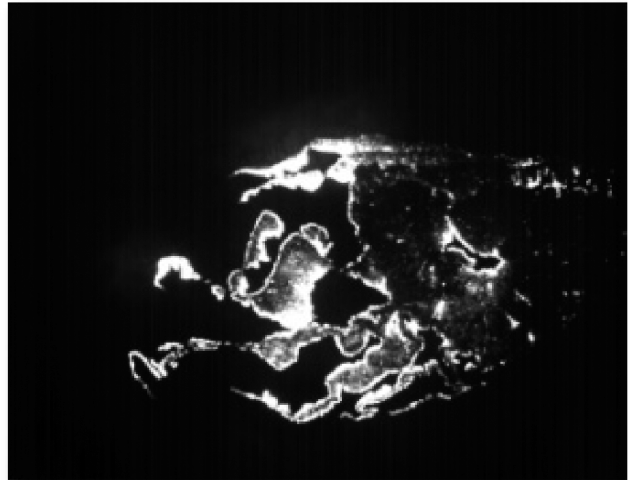


Image **B** – Thermal infrared

Fig. 3.1

- (a) (i) What is the source of the radiation in each image?

image **A**

image **B** [2]

- (ii) Explain which image would be more useful to firefighters.

.....

..... [1]

- (b) The images in Fig. 3.1 are grey-scale satellite images.

Describe how a grey-scale image is generated.



In your answer, you should use appropriate technical terms, spelled correctly.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Some frequencies of infrared emitted by Earth may never reach the satellite.

(i) Explain why this can occur.

.....
.....
.....
..... [2]

(ii) One such wave has a frequency of 2.0×10^{13} Hz. It travels at a speed of 3.0×10^8 m s⁻¹.

Calculate its wavelength.
Give your answer in standard form.

wavelength = unit [3]

(d) Near infrared radiation (NIR) is also used in remote sensing.

(i) Use one of the phrases in the box to complete the sentences to best describe a wave of NIR.

longer than	the same length as	shorter than
-------------	--------------------	--------------

The wavelength of NIR is the wavelength of visible light.

The wavelength of NIR is the wavelength of thermal infrared. [1]

(ii) There are environmental concerns about the effects of human activity on rainforests in Indonesia.

Explain how NIR can be used to monitor these rainforests.

.....
.....
.....
..... [2]

[Total: 15]

4 As the human population grows, it will become more difficult to meet our needs for food from agricultural land alone. However, the oceans and lakes of the world contain enormous amounts of biomass produced by algae using photosynthesis.

(a) (i) State what is meant by the term *biomass*.

.....
..... [1]

(ii) Explain how algae produce biomass using photosynthesis.



In your answer, you should use appropriate technical terms, spelled correctly.

.....
.....
.....
.....
.....
..... [3]

(b) Scientists in Germany have grown algae in ponds in greenhouses near some power stations. Waste gas from the power station is bubbled through the ponds of algae to encourage the growth.

State which waste gas helps the algae grow faster and how this gas is produced.

.....
.....
..... [2]

(c) State two **other** conditions, apart from sunlight, that need to be provided for maximum growth of the algae.

1.
2. [2]

- 5 A student noticed that the compost heap in his garden was quite warm so he decided to investigate how the temperature changes in a compost heap over time.

He built a new heap and inserted a temperature sensor into its centre. The results could then be displayed on a computer. A graph of his results is shown in Fig. 5.1.

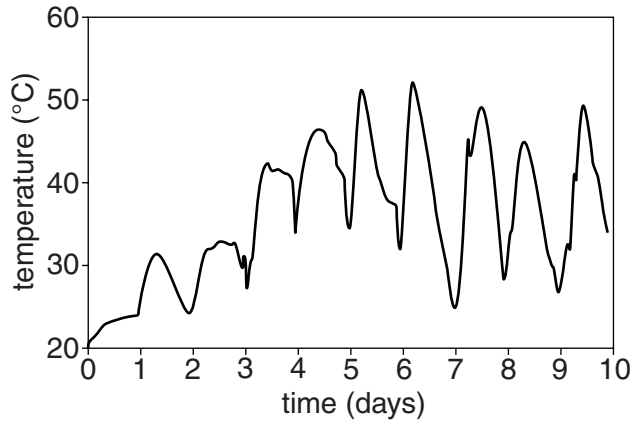


Fig. 5.1

- (a) (i) Name the type of organism that is responsible for decay in a compost heap.

..... [1]

- (ii) Using the data, describe what is happening to the temperature of the compost heap and suggest an explanation.

description

.....

.....

explanation

.....

..... [4]

(b) Compost is added to soil to improve its mineral content. Some gardeners supplement this with chemicals. These chemicals are made from ammonia (NH_3) produced by the Haber process.

(i) Write a word equation for the chemical reaction involved in the Haber process.

[1]

(ii) The Haber process uses a temperature of 450°C .

State two other conditions necessary for this process to occur economically.

1.

2. [2]

(iii) The ammonia can then be converted into a chemical that plants can use.

State the name of that chemical.

..... [1]

[Total: 9]

END OF QUESTION PAPER

